LIQUID APPLICATOR VALVE

BACKGROUND OF THE INVENTION

Field of the Invention

A liquid valve body for attachment with the neck of a liquid container has liquid dispensed by inverting the container and pressing on an implement, such as one having tines, that in turn presses on an elastic closure cap having a valve seal that is lifted off of its seat on a stopper to pass liquid therethrough.

Description of Related Art

The dispensing of fluids by application of pressure against the coating or writing implement is common in the art. This application is a modification of the "Liquid Applicator Valve" of Gilbert Schwartzman, U.S. Patent No. 6,402,413, issued 11 June 2002, incorporated herein by reference. G. Schwartzman, U.S. Patent No. 3,129,452, teaches a pressure opened valve held closed using a compressible material under the coating surface with the coating surface held in place over the compressible material by placement of the outer perimeter of the coating surface within a surrounding groove and crimping or swagging it in the groove to clamp it there. Waters et al, U.S. Patent No. 5,120,148, issued 9 June 1992, teaches a resilient cap that biases a valve against a valve seat. The resilient cap is provided with a rib around its lower end, that is used to hold the cap in position, and dispensing holes in its upper end used as a dauber.

SUMMARY OF THE INVENTION

The invention is to an instrument for the application of a fluid for coating or treating by dispensing fluid from a container. The instrument consists of a stopper and an elastic closure cap. The elastic closure cap is one integral piece that essentially consists of a diaphragm and an elastic dome, that acts as a spring, and a valve neck with a sealing rib that engages with a valve seat on the stopper to form a fluid flow control.

The elastic closure cap is attached to, or inserted into, an annular recess in the stopper so that a force is created on the dome area of the elastic closure cap pressing the sealing rib against the stopper valve seat precluding fluid flow through the instrument or pressing the sealing rib away from the valve seat. Fluid is dispensed by pressing against the nib or other implement that in turn presses against the valve neck and lifts the sealing rib off of the valve seat to provide a flow path between the fluid container and the nib. The implement can include tines that rub or scrape and coat a surface.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of the applicator valve of the invention.

Fig. 2 is a sectional view of the application valve taken along the section line 2-2 of Fig. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention is to an applicator **40**. The major components shown in Fig. 1 are a stopper **48** and an elastic closure cap **47**, that attach to a fluid container (not shown). The stopper **48** fits within or over a container neck to act as a seal against unwanted fluid discharge and as a controlled passage for fluid discharge. The stopper **48** supports the elastic closure cap **47** and the closure cap secures an implement, such as on having tines **51**, in place. Pressure on the tines and/or diaphragm **49** portion of the elastic closure cap opens a fluid flow passage so that the fluid can pass from the fluid container to the elastic closure cap **47** and through the slot openings **44** to an object.

The individual components and interrelationships are best seen in Fig. 2. The stopper **48** second or lower end **41**, as shown, is designed to fit within the upper neck of a fluid container by inserting the stopper lower neck **41** into the container neck or opening. The stopper second or lower end could be designed to fit over a container neck or both over and within the container neck if desired.

The first upper end **65** of the stopper **48** has a raised upwardly extending interior section **53** formed about a central opening **54**. The lower wall of the stopper interior section **53** is sloped inwardly and upwardly forming a tapered valve seat **57** that ends or terminates in

the central opening **54** fluid passage. The upper first end of the interior section **53** is provided with a raised circular limit rib **42**. The outer wall of the interior section forms a sealing rim **43** that terminates at its lower end in a recessed base **63**. Extending essentially parallel to and outwardly from the sealing rim **43** is an outer circumferential side wall **62** of the stopper that terminates, slightly above the circular limit rib **42**, with an inwardly extending side wall **50**.

The elastic closure cap 47 has an integral central diaphragm area **49** extending outwardly into a dome-shaped intermediate area section **52** with a skirt area **64** extending downwardly from the lower radial extremity of the intermediate dome area **52** forming a first end. A flexible or resilient implement, such as coating or scraping tines **51**, extend upwardly from the diaphragm upper area **49** extremity. The dome area is provided with slot openings **44** inwardly of and adjacent to the intermediate area **52**. About the center of the diaphragm area, a valve neck **45** extends downwardly from the diaphragm. At the lower end of the valve neck, a circular sealing lip **46** extends outwardly. The valve neck **45** is preferably hollow to reduce rigidity. The inner lower first end of the skirt area **64** is provided with a sealing enlargement or rib **55**. The sealing rib enables a firm securement of the closure cap on the stopper so that the tines can be used to rub a surface with a coating material and/or to remove incidental material on a surface.

The elastic closure cap **47** can be made from an elastic resilient stretchable material such as a plastic or natural or synthetic rubber material having the necessary elasticity or

resilience to flex or extend for insertion into or over the stopper **48**, and to deform or stretch enough for sealing and valve operation, and to hold the implement. The material must be compatible with the fluid used. The tines can be strong enough to scrape a surface if desired. The diaphragm slot opening **44** performs two functions, it weakens the resistance to deformation of the central area of the diaphragm **49** and it provides a passage for the fluid moving past the sealing lip **46** when the valve neck is pressed inwardly.

The components are assembled by placing the stopper **48** neck **41** within a fluid container. The elastic closure cap **47** skirt **64** has a slightly larger diameter than that of the circumferential side wall **61** inside diameter, and the valve neck **45** has a smaller outside diameter than that of the diameter of the fluid passage **54** in the valve seat **57**. The outside diameter of the sealing lip **46** is larger than that of the fluid passage **54**. The skirt area **64** and sealing rib **55** can be pressed into the circumferential recess, between the side wall **62** and sealing rim **43** as the sealing lip **46** is pressed through the fluid passage in the tapered valve seat **57** until the elastic cap sealing rib **55** base or first end approaches the recess base **63** leaving a small void area **59**. Pressing the elastic closure cap skirt **64** into the circumferential recess between the circumferential side wall **61** and sealing rim **43** places the dome area **49** under the compression, tending to press or deform the attached diaphragm and dome primarily upwardly. This upward movement of the dome area places an upward tension force on the central area of the diaphragm **49** and valve neck **45**, attached to the diaphragm, and on the sealing lip **46** on the valve neck. This deformation or upward force causes a spring-like force

on the valve neck **45** and sealing lip **46**, preventing fluid flow by engaging the sealing lip with the stopper valve seat **57**.

During non-use, the fluid within a fluid container is sealed therein by the sealing lip **46** of the elastic closure cap **47** pressing against the tapered valve seaat **57**. The fluid within the container can be dispensed to the implement by holding the container in the inverted posision and pressing the implement against a surface or object. Upward and inward pressure on the inverted implement is transferred to the diaphragm area **49** where it acts against the now downward force created by the dome area **52** of the elastic cap **47**. Overcoming the diaphragm resistance results in an inward movement of the valve neck **45** and sealing lip **46**. The inward movement of the sealing lip causes it to separate from the tapered valve seat and to open a passage from the fluid container to the implement base or back through the fluid passage **54** and slot openings **44**. The limit rib **42** of the stopper functions both as a guide for fluid flow, during fluid discharge, and to a degree as a limit stop for inward movement of the valve neck **45** and sealing lip **46**. The limit rib **42** helps prevent the slots **44** of the elastic closure cap from being blocked by the upper end of the interior section **53** during pressure application against the times **51** and diaphragm **49**. The limit rib can have its height and position, with respect to the opening or passage, adjusted depending on the rigidity and elasticity of the elastic closure cap, the flow path desired, the viscosity of the liquid or fluid being used, the valve opening desired, etc.

The lower end of the skirt **64** is offset forming a shoulder **66** and an annular recess inwardly of the sealing rib **55**. The upper outer end of the sealing rib **55** extends upwardly into an annular projection **68** forming an outer recess **69**.

The times **51** can be used as both liquid applicator and rubbing member. They can scrape a surface or a coating on a surface to be acted on in concert with a material dispensed onto the surface. It is preferred to firmly secure the elastic closure cap to the stopper. To do this, in addition to the resilient frictional forces that can be used between the stopper and elastic closure cap skirt, the stopper upper circumferential projection **61** is crimped or swagged inwardly and downwardly **50** into the outer recess **69** in the sealing rib **55**. The terminal end **56** of the stopper upper end **50** is positioned within the outer recess **69**. This results in the sealing rib **55** being thicker than the space remaining between the stopper extended interior sections and stopper first upper end **50**. The terminal end **56** of the circumferential projection can be pressed against the closure skirt **64** with some indentation into it, and can press the dome inwardly reducing the outer circumference of the elastic cap at that area of the skirt **64**.

It is believed that the construction, operation and advantages of this invention will be apparent to those skilled in the art. It is to be understood that the present disclosure is illustrative only and that changes, variations, substitutions, modifications and equivalents will

be readily apparent to one skilled in the art and that such may be made without departing from the spirit of the invention as defined by the following claims.